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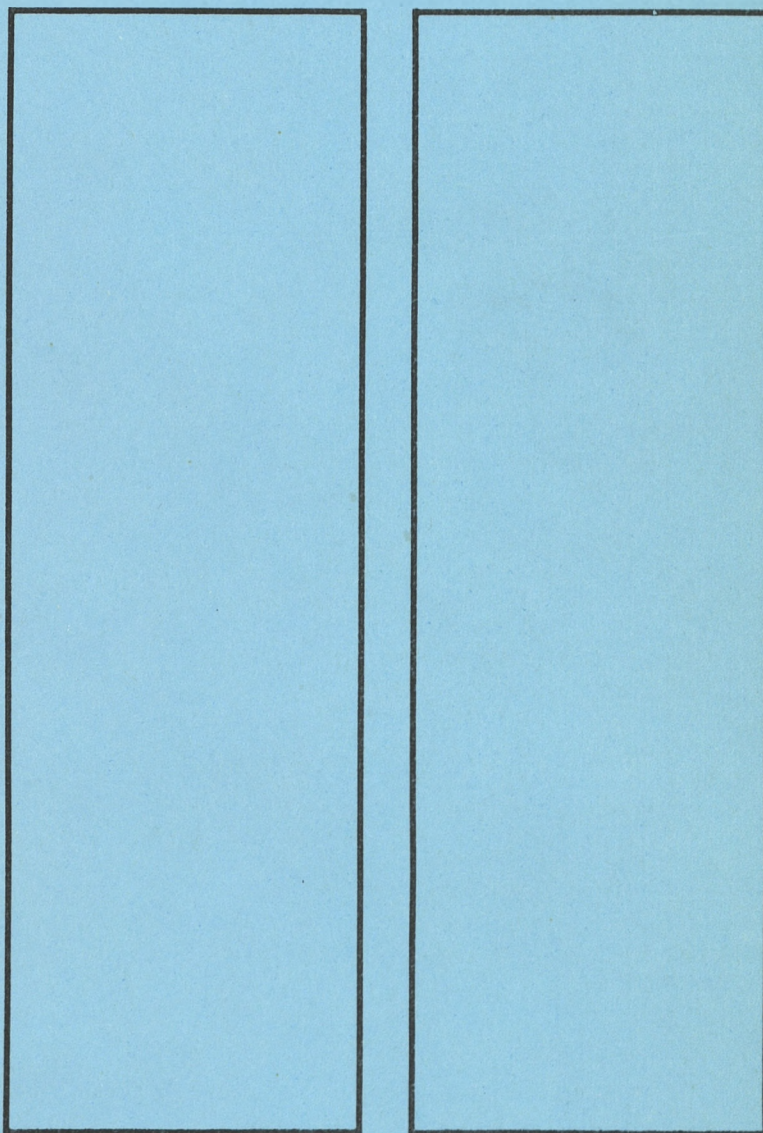
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**PHYSICAL, MECHANICAL, AND OTHER
PROPERTIES OF SELECTED SECONDARY
SPECIES in Surinam, Peru, Colombia,
Nigeria, Gabon, Philippines, and Malaysia**

Office of Science and Technology
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FPL-AID-PASA TA(AJ)2-73 (Species Properties)

PHYSICAL, MECHANICAL, AND OTHER PROPERTIES
OF SELECTED SECONDARY SPECIES
LOCATED IN SURINAM, PERU, COLOMBIA,
NIGERIA, GABON, PHILIPPINES, AND MALAYSIA

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INTRODUCTION

This report is a partial response to a Participating Agency Service Agreement between the Agency for International Development and the USDA, Forest Service (PASA Control No. TA(AJ)2-73) and concerns a study of the factors influencing the utilization of the tropical forest resource.

The purpose of this portion of the PASA obligation is to present previously published information on the tree and wood characteristics of selected secondary species growing in seven tropical countries.

The format is concise and follows the outline developed for the second edition of the "Handbook of Hardwoods" published by HMSO, London.

Species selected for review are well known in the source countries, but make up a very small component, if any, of their export trade. The reasons why these species play a secondary role in the timber harvest are discussed in the other accompanying PASA reports.

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SURINAM

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3. Vink, A. T.
1965. Surinam timbers. Surinam Forest Service. Paramaribo.

Range: From southern Mexico through Central America to northern South America and throughout the West Indies.

THE TIMBER

Basic specific gravity	0.64
Bending strength	20,900 lb/in. ²
Modulus of elasticity.	2,640,000 lb/in. ²

Processing	Drying:	Easy to air season drying at a moderate rate with little degrade; kiln-dried without difficulty.
	Shrinkage:	Green to oven-dry:
		Radial 6.9 percent
		Tangential 7.4 percent
		Volumetric 13.9 percent

Working properties:
The wood saws and works fairly well except that it is difficult to plane to a smooth surface because of the bands of soft parenchyma tissue. Takes nails and screws well and glues satisfactorily.

Durability and preservation	Heartwood is resistant to decay and insect attack. Wood is moderately difficult to preserve with pressure treatments, retention very variable.
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Uses Heavy construction, house framing, turnery, furniture, cabinetwork, parquet flooring, veneer.

References 2, 3.

Eperu falcata
Walaba

3

Other names: Apa...Brazil; palo machete...Venezuela;
wapa...Fr. Guiana.

Range: Centered in the Guianas but extend into
Venezuela and the Amazon region of Brazil.

THE TREE

Trees with a few large or small buttresses, 80-100 ft
in height, diameter commonly to 24 in., occasionally to
over 40 in. in diameter, cylindrical bole 40-50 ft long.

THE TIMBER

Properties Color: Sapwood 1 to 2 in. wide, grayish or brownish-
white; heartwood dark red brown or reddish-
purple, gummy exudations.

Grain: Uniformly straight grain, medium to coarse
texture, low luster.

Weight: Basic specific gravity averages about 0.78
(58 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	16,000	2,550	8,070
12 percent	22,000	2,880	10,230

Processing Drying: Walaba dries slowly with a marked tendency to
warp and split. Air seasoning prior to kiln
drying is advisable.

Shrinkage: Green to oven-dry:
Radial 3.6 percent
Tangential 6.9 percent
Volumetric 10.0 percent

Working properties:

Fairly easy to work but somewhat difficult to
saw; gum tends to clog cutting tools.
Preboring necessary for nailing.

Durability and
preservation

Heartwood highly resistant to decay and fairly resistant
to drywood termites. Extremely resistant to
preservative treatment.

Uses Heavy construction, railway crossties, utility poles,
industrial flooring, shingles.

References 1, 2, 3.

Other names: Black kakaralli...Guyana; mahoe noir...
Fr. Guiana; mata-mata...Brazil.

Range: Eastern Brazil through to the Guianas,
Trinidad, and northward to Costa Rica.

THE TREE Normally 90-120 ft in height, 16-20 and occasionally up
to 40 in. in diameter, well-formed boles up to 60 ft
long, often somewhat fluted.

THE TIMBER

Properties Color: Sapwood yellowish-gray, 2-5 in. wide, not
sharply differentiated from the gray-brown
heartwood but becomes more distinct on
drying.

Grain: Grain typically straight, texture fine to
medium, luster low to moderate. Silica
content high.

Weight: Basic specific gravity averages about 0.87
(67 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	17,110	2,700	7,340
12 percent	26,470	3,140	11,210

Processing Drying: Moderately difficult to air season, dries at a
moderate rate, slight warping and checking.

Shrinkage: Green to oven-dry:
Radial 5.8 percent
Tangential 10.3 percent
Volumetric 15.9 percent

Working properties:

The wood is difficult to saw and work because of
high density and silica content, easy to split.

Durability and
preservation

Heartwood highly resistant to insects and decay fungi
as well as marine borers.

Uses Marine piling, heavy construction, boatbuilding,
industrial flooring, railway crossties.

References 2, 3.

Micropholis guyanensis
Pouteria engleri
Riemhout

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Other names: Konoko...Guyana; balata blanc...
Fr. Guiana.

Range: Guianas, Amazon region.

THE TREE Buttressed canopy tree to 110 ft in height, 25-30 in.
in diameter, straight cylindrical bole 50-60 ft long.

THE TIMBER

Properties Color: The very thick sapwood is hardly differentiated
from the heartwood which is yellow-to-gray-
brown with a somewhat pinkish tinge.

Grain: Grain straight or slightly interlocked,
sometimes wavy, luster medium. Silica
content up to 1.5 percent.

Weight: Average basic density 0.64 (51 lb/ft³
air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	^{1,000} lb/in. ²	Lb/in. ²
Green	13,630	2,470	6,610
12 percent	18,890	2,950	9,820

Processing Drying: Moderately difficult to air season with
warping and checking common, dries rapidly,
prone to staining.
Shrinkage: Green to oven-dry:
Radial 5.8 percent
Tangential 8.5 percent
Volumetric 14.3 percent

Working properties:
Somewhat difficult to work on account of
silica, finishes smoothly.

Durability and
preservation Moderately resistant to decay but not very resistant to
termite attack. High silica material resistant to
teredo attack. Sapwood is treatable.

Uses Construction under cover, interior work, paneling,
furniture.

Reference 3.

Ocotea spp. and Nectandra spp.
Pisi

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Other names: Kereti silverballi...Guyana; cèdre gris...
Fr. guiana.

Range: Guianas and tropical South America.

THE TREE

Pisi is a grouping of about nine genera of the Lauraceae and descriptions are most general. Tall unbuttressed trees about 100 ft high, commonly to 25 in. in diameter, occasionally to 40 in., clear bole 50-60 ft.

THE TIMBER

Properties Color: Heartwood gray-yellow, straw color, brown-yellow; sapwood 1-1/2 to 2 in. wide, somewhat lighter in color.

Grain: Grain straight, occasionally somewhat roey, texture rather fine to moderately coarse, luster medium to high.

Weight: Varies considerably but basic specific gravity averages about 0.45 (35 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	8,830	1,660	4,610
12 percent	11,730	1,840	6,650

Processing Drying: Pisi timber seasons well with little degrade.

Shrinkage: Green to oven-dry:

Radial	3.0 percent
Tangential	6.7 percent
Volumetric	9.3 percent

Working properties:

The wood saws well, finishes smoothly in all operations, glues and paints well.

Durability and preservation Moderately resistant to insects and decay fungi and rather vulnerable to drywood termites. Not resistant to marine borers. Difficult to impregnate.

Uses General carpentry, millwork, furniture, turnery, utility plywood.

References 2, 3.

Parinari campestris
Parinari excelsa
Foengoe

7

Other names: Parinari...Brazil; bois bandé...
Trinidad; burada...Guyana.

Range: Guianas, Trinidad, northern Brazil,
P. excelsa found in West, Central, and
East Africa.

THE TREE Dominant trees with low, thick buttresses commonly
30 in. in diameter, occasionally up to 40 in.,
cylindrical boles 40-50 ft.

THE TIMBER

Properties Color: Heartwood gray-brown, yellow-brown, or
yellowish pink-brown, sapwood somewhat
paler, not clearly defined.

Grain: Grain generally straight, sometimes inter-
locked, texture moderately coarse, luster
medium. High silica content.

Weight: Average basic specific gravity 0.69
(49 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	12,750	2,120	5,800
12 percent	20,120	2,610	10,260

Processing Drying: Mild drying conditions suggested for both
species. P. excelsa more difficult to dry
without degrade and seasons more slowly.

Shrinkage: Green to oven-dry:
Radial 5.9 percent
Tangential 10.0 percent
Volumetric 14.6 percent

Working properties:
Wood is difficult to machine because of hard-
ness and high silica content, should be
prebored for nailing, takes only a fair finish.

Durability and preservation Heartwood has slight to moderate resistance to decay but
resistant to marine borers, conflicting reports on
treatability.

Uses Marine construction, if continuously submerged, and
other heavy construction if covered.

References 1, 3.

Protium spp.
Trattinickia spp.
 Tingimoni

Other names: Kurokai...Guyana; elimi...Brazil;
 encens gris...Fr. Guiana.

Range: Most common in Guyana but found rather
 frequently in northern South America.

THE TREE Varying with species, trees range from 70-110 ft in
 height, diameter 15-25 in., clear boles 40-65 ft.

THE TIMBER

Properties Color: Heartwood pinkish-brown, not sharply
 differentiated from sapwood.

Grain: Grain straight or wavy sometimes slightly to
 moderately interlocked, texture rather fine
 to coarse, luster medium to high.

Weight: Basic specific gravity averages 0.53
 (40 lb/ft³ air-dry but frequently as low as
 30 lb/ft³).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	9,300	1,510	4,370
12 percent	11,800	1,650	6,960

Processing Drying: Fairly easy to season, dries rapidly, tends to
 cup and twist.

Shrinkage: Green to oven-dry:
 Radial 4.2 percent
 Tangential 6.8 percent
 Volumetric 10.7 percent

Working properties:

Works easily to a smooth finish, resin accumu-
 lates and clogs the teeth in log conversion,
 with care will take a good finish.

Durability and preservation

Little or no resistance to decay or insect attack.
 Woods are moderately easy to preserve.

Uses General carpentry, millwork, furniture, plywood,
 boxes and crates.

References 1, 2, 3.

Other names: Grignon fou...Fr. Guiana; mandioguiera...
Brazil; florecillo...Venezuela.

Range: Guianas, Brazil (Para, Maranhao,
Amazonas).

THE TREE Trees often 150-200 ft in height, with long clear boles
to 65 ft, commonly 30-40 in. in diameter, stems are
buttressed.

THE TIMBER

Properties Color: Sapwood cream-colored to light brown, 1-1/4
to 2-1/4 in. thick, usually distinct from
the light reddish-brown heartwood.

Grain: Often slightly to moderately interlocked,
texture moderately coarse, luster is high.

Weight: Basic specific gravity averages about 0.50
(39 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	9,570	1,830	5,020
12 percent	14,320	2,080	8,120

Processing Drying: Wood is moderately difficult to air season
and kiln-dry. It seasons rapidly but with
some warping and checking. Stain may
develop in air drying.

Shrinkage: Green to oven-dry:

Radial	4.2 percent
Tangential	8.1 percent
Volumetric	12.1 percent

Working properties:

Moderately difficult to work but saws readily
and planes well except if roey grain is
present, cutting edges are dulled when silica
is present. Nails and screws well.

Durability and preservation In general heartwood is moderately durable, fairly
resistant to drywood termite attack.

Uses General construction, carpentry, millwork, flooring,
furniture, utility plywood, veneer.

References 2, 3.

Range: Central America and south to the Guianas,
Venezuela, and Brazil.

A large unbuttressed tree of the upper story with heights to 140 ft. Straight cylindrical boles frequently clear to 70 ft and more. Diameters up to 30 in.

Properties	Color:	Sapwood indistinct, heartwood uniform cream color when dry.
	Grain:	Grain is straight, texture is uniform and medium, luster is high.
	Weight:	Average basic specific gravity 0.38 (27 lb/ft ³ air-dry).
	Strength:	(2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	6,310	1,140	2,970
12 percent	8,930	1,240	4,840

Processing Drying: Easy to season and dries rapidly with little degrade. Susceptible to sap-stain fungi before and during drying.

Shrinkage: Green to ovendry:

Radial	2.3 percent
Tangential	5.0 percent
Volumetric	8.0 percent

The wood works easily with all hand and machine tools, dresses smoothly, holds nails and screws well, easy to glue.

Durability is variable but generally low, highly vulnerable to drywood termites. The wood has good treatability.

References 2, 3.

Other names: Haiawaballi...Guyana; encens rouge...
Fr. Guiana; secuadra...Panama.

Range: Central America to the Guianas and
western Brazil.

THE TREE A canopy tree with few buttresses about 100 ft high,
bole of moderately good form to 40 ft lengths,
diameters to about 25 in.

THE TIMBER

Properties Color: One and one-half to 2-1/2 in. wide sapwood
yellowish-brown to pinkish-gray, heartwood
distinct and orange-brown.

Grain: Grain straight, sometimes roey or irregular,
texture rather fine, luster high.

Weight: Average basic specific gravity 0.78
(56 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{lb/in.^2}$	Lb/in. ²
12 percent	16,170	2,070	10,550

Processing Drying: Moderately difficult to season, dries rather
slowly with a tendency to check and split.

Shrinkage: Green to ovendry:
Radial 5.8 percent
Tangential 9.4 percent
Volumetric 14.9 percent

Working properties:
Wood works well with all tools to a smooth
finish, difficult to nail but takes screws
well, polishes well to an attractive luster.

Durability and preservation Wood is rather durable to moderately durable with good
resistance to insect attack. Moderately difficult to
preserve.

Uses General construction, strip and parquet flooring,
paneling, furniture, millwork.

Reference 3.

PERU

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Range: Southern Mexico and southward into northern South America, throughout the West Indies.

THE TIMBER

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	10,490	1,590	4,560
12 percent	14,640	1,830	6,910

Radial	4.8 percent
Tangential	7.1 percent
Volumetric	12.3 percent

Moderately easy to work but there is some difficulty in planing interlocked grain on quartered surfaces, holds nails and screws well.

Heartwood is rated as durable but has no resistance to drywood termites. Heartwood is very difficult to impregnate with preservatives.

Reference 7.

Copaifera reticulata
Copaiba

Other names: Canime...Colombia; aceite...Venezuela;
copahiba...Brazil.

Range: The genus ranges from Panama southward
into Colombia, Peru, Venezuela, and into
the Amazon region.

THE TREE Up to 100 ft in height with diameters to 40 in. and
more, source of copaiba balsam.

THE TIMBER

Properties Color: Heartwood reddish-brown, sometimes streaked,
sapwood pinkish-gray or nearly white.

Grain: Usually straight grained, medium textured.

Weight: Basic specific gravity about 0.64
(50 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	^{1,000} lb/in. ²	Lb/in. ²
Green	12,980	2,270	6,070
12 percent	21,200	2,650	10,700

Processing Drying: Wood of this genus reported to have a
moderate drying rate with little degrade.

Shrinkage: Green to oven-dry:

Radial	4.4 percent
Tangential	9.2 percent
Volumetric	14.6 percent

Working properties:
Not difficult to work, finishes smoothly.

Durability and preservation Heartwood is highly durable, very difficult to preserve.

Uses General construction, flooring, carpentry, railroad
crossties.

References 5, 11.

Cordia alliodora
Ajo-ajo

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Other names: Amapa prieta...Mexico; laurel...Ecuador;
alatrique...Venezuela; canalete de
humo...Colombia.

Range: In the West Indies and from southern
Mexico to the southern edge of the
tropics in South America.

THE TREE

Usually a medium-sized tree to 60 ft in height with
diameters to 24 in., occasionally to heights of 120 ft
with diameters up to 36 in., boles are long and
symmetrical with narrow buttresses usually less than
6 ft in height.

THE TIMBER

Properties Color: Sapwood to 3 in. wide, yellowish to light
brown not sharply demarcated from the
golden brown heartwood, dark streaking
makes an attractive figure.

Grain: Generally straight, sometimes interlocked,
texture fine to medium, luster medium to high.

Weight: Average basic specific gravity 0.44
(33 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	9,050	1,280	4,040
12 percent	12,180	1,510	6,330

Processing Drying: Air seasons easily with a minimum of defect,
only slight checking and warping resulted from
rapid drying.

Shrinkage: Green to oven-dry:
Radial 3.4 percent
Tangential 7.1 percent
Volumetric 9.2 percent

Working properties:
Easy to work in all operations.

Durability and
preservation

Good resistance to decay and termite attack, dark-
colored wood is highly durable, moderately easy to
preserve.

Uses Cabinetwork, furniture, millwork, turnery, veneer,
boatbuilding.

References 2, 9.

Range: Central and tropical South America,
West Indies.

THE TREE

A medium-sized to large tree, sometimes over 100 ft in height, diameter 30 in., cylindrical bole but basally swollen.

THE TIMBER

Properties Color: Wood pale brownish without distinction
 between heartwood and sapwood.

Grain: Usually straight, texture rather fine to medium, lustrous.

Weight: Average basic specific gravity 0.45
(35 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
12 percent	11,980	1,820	6,900

Processing Drying: The wood seasons rapidly but with considerable
degrade in the form of warp, tends to sap-stain.
Shrinkage: Green to ovendry:

Radial	5.9 percent
Tangential	9.2 percent
Volumetric	14.8 percent

Working properties:

Works easily with either hand or power tools, occasional fuzziness, tearing of fibers in turning and boring.

Durability and preservation

Wood is very susceptible to attack by decay fungi and insects. Easy to treat by immersion and pressure systems.

Uses Matches, plywood, interior construction, boxes and crates, paper pulp.

References 1, 6, 8.

Guarea trichilioides
Requia-Latapi

Other names: Pico del oro...Panama; bailador...Colombia;
bilreiro...Brazil; guaragua...Puerto
Rico, trompillo...Venezuela.

Range: From the West Indies and Central America
to southern Brazil and Argentina.

THE TREE A medium-sized tree but sometimes over 100 ft in height,
diameters to 36 in. and more.

THE TIMBER

Properties Color: Whitish to brownish sapwood not clearly
 demarcated from reddish-brown heartwood.

 Grain: Straight to slightly interlocked, texture
 medium, luster is rather low.

 Weight: Average basic specific gravity 0.51
 (37 lb/ft³ air-dry).

 Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
12 percent	15,960	2,070	--

Processing Drying: The wood air seasons slowly with only a
 moderate amount of warp, no surface checking.

 Shrinkage: Green to ovendry:
 Radial 3.8 percent
 Tangential 7.7 percent
 Volumetric 11.3 percent

Working properties:

Saws and machines easily in all operations,
wood has a tendency to tear and crumble in
boring.

Durability and
preservation

Heartwood has good durability in ground contact and
high resistance to drywood termite attack. Highly
resistant to impregnation with preservatives.

Uses Furniture, cabinetwork, turnery, interior trim, general
carpentry, veneer, boat construction.

References 5, 6.

Guazuma ulmifolia
Lumanasi

Other names: Aguiche...Mexico; caulote...Honduras;
guácimo colorado...Colombia; ibixuma...
Brazil; guacimo...Venezuela.

Range: West Indies, most of Mexico, Central
America, and South America to southern
Brazil and Argentina.

THE TREE A medium-sized tree occasionally over 65 ft in height,
up to 24 in. in diameter.

THE TIMBER

Properties Color: Sapwood is light brown, heartwood is pinkish
to brownish.

Grain: Grain generally straight, texture medium,
moderate luster.

Weight: Basic specific gravity averages 0.50
(37 lb/ft³ air-dry).

Strength: (1- and 2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
12 percent	16,260	1,820	7,510

Processing Drying: A fast drying wood with no serious degrade.
Shrinkage: Green to oven-dry:
Radial 4.0 percent
Tangential 7.2 percent
Volumetric 11.2 percent

Working properties:
The wood is easy to work and easy to obtain a
smooth finish.

Durability and
preservation Heartwood is not durable, vulnerable to both fungal and
termite attack. Both heartwood and sapwood very easy
to treat by both pressure and nonpressure processes.

Uses General carpentry, interior construction, furniture,
slack cooperage, utility plywood.

References 1, 4.

Other names: Jabillo...Central America; assacú...Brazil;
possumwood,...United States, ochohó...
Bolivia.

Range: From southern Mexico through to northern
Brazil and Boliva, also throughout the
West Indies.

THE TREE Commonly a large, straight, well-formed tree reaching
heights of 90-130 ft and sometimes up to 200 ft, clear
boles 40-75 ft long are usual. Diameters 40-60 in.
are common and may reach 100.

THE TIMBER

Properties Color: Sapwood is yellowish-white often not distinct
from the pale yellowish-brown heartwood.

Grain: Straight to interlocked often with an
attractive ribbon stripe, texture fine,
luster high.

Weight: Average basic specific gravity 0.38
(38 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	6,310	1,040	2,790
12 percent	8,710	1,170	4,800

Processing Drying: Moderately difficult to air season, dries
rapidly with some warping, prone to attack by
sap-stain fungi.

Shrinkage: Green to oven-dry:

Radial 2.7 percent
Tangential 4.5 percent
Volumetric 7.3 percent

Working properties

Green wood difficult to work because of fuzzy
grain, but readily machined when dry. Chipped
and torn grain frequent when cutting
interlocked grain, nails well.

Durability and
preservation

Wood is fairly resistant to decay fungi but is very
vulnerable to drywood termite attack. Easy to impregnate.

Uses General carpentry, interior construction, boxes and
crates, veneer, plywood, furniture, joinery.

References 3, 7.

Other names: Kaneelhout...Surinam; tapinhoam...Brazil.

Range: Guianas to eastern and northern part of the Amazon basin and into the uplands.

THE TREE A large tree to 120 ft in height and more, diameters to 30 in.

THE TIMBER

Properties Color: Sapwood narrow, about 1 in. wide, light grayish-brown. Dry heartwood dark olive brown, oily appearance and feel.

Grain: Straight or interlocked, texture fine, luster generally low.

Weight: Average basic specific gravity 0.68
(51 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	11,340	1,800	5,570
12 percent	15,200	2,040	8,590

Processing Drying: Difficult to air season, material dried at a moderate rate developed slight to moderate warp and both surface and end checking. Mild seasoning conditions should be employed.

Shrinkage: Green to oven-dry:
Radial 2.4 percent
Tangential 7.0 percent
Volumetric 10.6 percent

Working properties:
Difficult to machine, particularly planing where strongly interlocked grain is present, torn grain common in boring.

Durability and preservation Highly resistant to decay and insects but somewhat variable when exposed to brown-rot fungi, some information on resistance to marine borers is contradictory.

Uses Furniture, boatbuilding, general carpentry, railway crossties, cooperage.

Reference 10.

Other names: Boncillo...Costa Rica; cerillo...Panama;
mataki...Surinam; vanani...Brazil.

Range: In West Indies, Central America, and
northern South America. Also found in
West Africa.

THE TREE Trees are frequently 100 ft in height, more rarely to
135 ft, diameters usually 20-30 in., but may reach
40 in. Boles are straight and cylindrical.

THE TIMBER

Properties Color: The sharply demarcated sapwood is 1-5 in. in
width, pale olive buff or gray-brown,
heartwood is yellowish-brown with pink or
greenish tinge.

Grain: Grain is straight with little decorative
figure, texture rather coarse, luster
medium or low.

Weight: Average basic specific gravity 0.58
(44 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	11,180	1,960	5,160
12 percent	16,860	2,460	8,820

Processing Drying: The wood air dries rapidly but tends to
moderate checking and warp.

Shrinkage: Green to ovendry:
Radial 5.7 percent
Tangential 9.7 percent
Volumetric 15.6 percent

Working properties:

Saws, planes, and turns easily but may tend to
roughen in shaping and planing, holds nails
and screws well.

Durability and
preservation

Heartwood ranges from resistant to moderately resistant
to decay but is vulnerable to termite attack.
Heartwood very difficult to impregnate.

Uses Veneer, flooring, general construction, millwork,
cooperage, cabinetwork, railway crossties.

References 8, 11.

Other names: Corpo...Mexico; San Juan...Honduras;
arracache...Colombia; caizeta...Brazil.

Range: The genus is represented from southern
Mexico to Peru, abundant in the Guianas
and Brazil.

THE TREE A large tree up to 120 ft in height, diameters to 36 in.
are common, clear boles to 50 ft.

THE TIMBER

Properties Color: Sapwood 1-2 in. wide, light brown in hue,
heartwood reddish-brown to light brown.

Grain: Straight to interlocked, decorative figure,
texture medium to coarse, luster high.

Weight: Average basic specific gravity 0.52
(39 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	8,530	1,600	3,960
12 percent	13,730	1,920	7,530

Processing Drying: Moderately difficult to air season, only
slight to moderate warp and slight checking
develops with fast to moderate drying rates.

Shrinkage: Green to oven-dry:

Radial	5.0 percent
Tangential	11.0 percent
Volumetric	15.9 percent

Working properties:

The wood is moderately difficult to work but
with no apparent dulling effect on cutting
tools, chipped and raised grain common in
planing quartered stock.

Durability and
preservation Varies considerably in decay resistance, tests indicate
heartwood very durable when exposed to white-rot
organism but not durable with respect to brown-rot
fungus.

Uses Furniture, general carpentry, interior trim, plywood
potential.

Reference 11.

COLOMBIA

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Other names: Espavé...Panama; akajoe...Surinam;
cajú assú...Brazil.

Range: Costa Rica south through Panama to
Colombia, Venezuela, and Ecuador.

THE TREE Trees 130-150 ft in height with clear straight boles to
60 ft, stumps swollen for 3-8 ft above the ground,
diameters commonly 40-60 in., sometimes to 80 in.

THE TIMBER

Properties Color: After exposure to light, heartwood is a uni-
form light russet-brown with a golden or red-
dish cast, sapwood 6-10 in. thick, grayish-
white and sharply demarcated from heartwood.

Grain: Generally interlocked giving a medium to
coarse ribbon stripe on radial surface,
texture medium to coarse, luster medium to
high.

Weight: Average basic specific gravity 0.41
(31 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	5,320	1,060	2,460
12 percent	7,960	1,280	4,530

Processing Drying: Wood dries at a variable rate, material that
dries rapidly tends to moderate warp and
checking.

Shrinkage: Green to oven-dry:
Radial 2.8 percent
Tangential 5.2 percent
Volumetric 8.4 percent

Working properties:

Easy to saw but has poor planing and sanding
properties and is rated good in shaping and
mortising, chipped grain and woolly surfaces
common.

Durability and preservation Heartwood durable but not resistant to termite attack.

Uses General carpentry, furniture, veneer, construction,
millwork.

References 3, 7, 8.

Aniba peruvialis
Laurel comino

Other names: Laurel capuchino...Venezuela; ishpingo chico...Peru; coto...Bolivia; ayuba... Brazil.

Range: Throughout the Andes to Bolivia.

THE TREE Trees 80-100 ft in height, clear boles to 60 ft, diameters to 24 in.

THE TIMBER

Properties Color: Heartwood is yellowish with a green tint, becoming olive on exposure, sapwood pinkish-yellow.

Grain: Straight to curly to interlocked, texture fine to medium, high luster.

Weight: Average basic specific gravity 0.48
(36 lb.ft³ air-dry).

Strength: (2-cm standard, 12 pct moisture content.)

Bending strength 13,870 lb/in.²

Processing Drying: Easy to air-dry with only a slight tendency to warp or check.

Shrinkage: Green to oven-dry:

Radial 4.8 percent

Tangential 8.2 percent

Volumetric 13.2 percent

Working properties:

Easy to work with hand and machine tools.

Durability and preservation Very resistant to fungal attack.

Uses Furniture, flooring, veneer, general carpentry, construction.

Reference 7.

Cariniana pyriformis
Abarco

Other names: Bacú...Venezuela; cerú...Brazil.

Range: Venezuela, Colombia, and Central Brazil.

THE TREE Trees 100 ft in height, occasionally to 130 ft, clear
boles to 80 ft, diameters to 80 in.

THE TIMBER

Properties Color: Heartwood reddish-brown, sometimes streaked,
not sharply demarcated from the pale brown
sapwood.

Grain: Generally straight but sometimes interlocked,
texture fine to medium, medium luster.

Weight: Average basic specific gravity 0.56
(45 lb.ft³ air-dry).

Strength: (2-cm standard, 12 pct moisture content.)

Bending strength 17,600 lb/in.²

Maximum crushing strength. . . . 8,380 lb/in.²

Processing Drying: Seasons rapidly with little tendency to warp
or check.

Shrinkage: Green to oven-dry:

Radial 6.0 percent

Tangential 7.0 percent

Volumetric 14.4 percent

Working properties:

Workable without difficulty but with
excessive tool wear.

Durability and
preservation

Heartwood durability is very high with very good
resistance to insect attack, because of high silica
believed to be resistant to marine borers.

Uses Railway crossties, shipbuilding, heavy construction,
flooring, furniture, veneer.

Reference 7.

Ceiba pentandra
Ceiba

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Other names: Pachote...Mexico; ceibón...Nicaragua;
sumaúma...Brazil; toborochi...Bolivia.

Range: Mexico southward through Central America
to Colombia, Venezuela, and Ecuador.

THE TREE

A large tree to heights of 150 ft, straight cylindrical trunk, sometimes swollen in the middle, diameters may be to 85 in.

THE TIMBER

Properties Color: Heartwood light grayish-brown, sometimes with a pinkish tinge, not distinct from the sapwood.

Grain: Generally straight, coarse textured, low luster.

Weight: Average basic specific gravity 0.25
(18 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	^{1,000} lb/in. ²	Lb/in. ²
Green	2,180	410	1,060
12 percent	4,330	540	2,380

Processing Drying: Easy to dry, free of warp and checking, very prone to stain.

Shrinkage: Green to oven-dry:

Radial 2.1 percent

Tangential 4.1 percent

Volumetric 7.7 percent.

Working properties:

Very easy to work but surfaces are generally poor, torn grain common.

Durability and preservation

Durability low and prone to insect attack, blue stain common, fairly easy to treat.

Uses Plywood corestock, boxes, cooperage, fiber and particleboard, pulp and paper.

References 1, 7, 9.

Centrolobium paraense

Guayacan hobo

Other names: Amarillo lagarto...Ecuador; balaustre...
Venezuela; morosimo...Paraguay;
araraúba...Brazil.

Range: Panama to Ecuador and southern Brazil and
Paraguay.

THE TREE Heights to 80 ft, clear boles to 60 ft, diameters
range between 30 and 45 in.

THE TIMBER

Properties Color: Heartwood yellow to reddish orange to
reddish-brown, sharply demarcated from
yellowish sapwood.

Grain: Generally straight, sometimes interlocked,
texture fine to somewhat medium, luster
medium to high.

Weight: Average basic specific gravity 0.60
(47 lb/ft³ air-dry).

Strength: (2-in. standard, 12 pct moisture content.)

Bending strength 18,600 lb.in.²
Maximum crushing strength. . . . 9,510 lb/in.²

Processing Drying: Moderately difficult to dry, slow drying keeps
warp and checking to a minimum.

Shrinkage: Green to ovendry:
Radial 2.6 percent
Tangential 5.1 percent
Volumetric 6.5 percent

Working properties:

Very easy to work with hand and machine
tools, dresses smoothly.

Durability and Heartwood durability somewhat high, difficult to treat.
preservation

Uses Fine furniture, parquet flooring, decorative veneers,
cabinetwork, turnery.

References 1, 7.

Dacryodes canalensis (?)Protium sp. (?)

Anime incienso

Other names: Tontón...Guatemala; alcanfor...Honduras;
curaña...Panama; guacharaco...Venezuela.

Range: West Indies, Central America, and
southward to Brazil and Paraguay.

THE TREE Medium-sized tree to 75 ft in height with diameters of
25-30 in., clear boles to 50 ft.

THE TIMBER

Properties Color: Heartwood is reddish-brown, sapwood
grayish-yellow.

Grain: Straight to somewhat interlocked, medium
texture, luster generally high.

Weight: Average basic specific gravity 0.55
(43 lb/ft³ air-dry).

Strength: (2-cm standard, 12 pct moisture content.)

Bending strength 21,870 lb/in.²
Maximum crushing strength. . . . 11,080 lb/in.²

Processing Drying: Easy to dry with little tendency to warp or
check.

Shrinkage: Green to oven-dry:
Radial 6.5 percent
Tangential 8.2 percent
Volumetric 15.0 percent

Working properties:
Moderately difficult to saw, other machining
operations vary from easy to moderately
difficult.

Durability and preservation Durability is low but is receptive to preservative
treatments.

Uses Construction, flooring, furniture, veneer, general
carpentry.

Reference 7.

Humiria procera
Chanul

Other names: Corosillo almendro...Panama; basra-
botrie...Surinam; couranira...Brazil.

Range: Panama southward to Colombia, Venezuela,
and Brazilian Amazon region.

THE TREE Tall tree to 130 ft in height, straight bole to 90 ft,
diameter 30-40 in.

THE TIMBER

Properties Color: Heartwood light brown with a reddish cast,
sapwood not sharply differentiated.

Grain: Generally straight, texture fine, luster
high.

Weight: Average basic specific gravity 0.64
(51 lb/ft³ air-dry).

Strength: (2-cm standard, 12 pct moisture content.)

Bending strength 24,200 lb/in.²

Maximum crushing strength. . . . 12,250 lb/in.²

Processing Drying: Varies from moderately difficult to easy,
checking is a problem particularly on end grain.

Shrinkage: Green to oven-dry:

Radial 7.7 percent

Tangential 10.8 percent

Volumetric 16.9 percent

Working properties:

Moderately difficult to work with hand and
machine tools but takes a smooth finish,
silica may be a problem.

Durability and preservation Heartwood believed to be highly durable, very difficult
to preserve.

Uses Railway crossties, industrial flooring, heavy
construction.

References 4, 7.

Inga sp.

Guamo churimo

Other names: Guavo...Panama; carbonero...Venezuela;
arapari...Peru; ca-ingá...Brazil.

Range: Throughout tropical America.

THE TREE

Trees to height of 100 ft, straight well-formed bole to 50 ft, diameters to 20 in.

THE TIMBER

Properties Color: Heartwood reddish with greenish-yellow streaks, sapwood somewhat lighter.

Grain: Wavy and interlocked, texture coarse, medium luster.

Weight: Average basic specific gravity 0.57
(44 lb/ft³ air-dry).

Strength: (2-cm standard, 12 pct moisture content.)

Bending strength 18,180 lb/in.²
Maximum crushing strength. . . . 8,800 lb/in.²

Processing Drying: Fairly easy to dry but tends to warp and check.
Shrinkage: Green to oven-dry:
Radial 4.4 percent
Tangential 7.9 percent
Volumetric 12.3 percent

Working properties:

Easy to saw and work with hand and machine tools, radial surfaces though do not machine smoothly due to interlocked grain.

Durability and preservation

Heartwood is believed to be moderately durable, easy to treat.

Uses

Railway crossties, transmission poles, general construction, furniture, plywood, flooring.

References 4, 7.

Manilkara bidentata
Balata

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Other names: Ausubo...Puerto Rico; nispero...Panama;
ácana...Venezuela; bulletwood...Guayana;
aprauá...Brazil.

Range: Panama, West Indies, northern
South America.

THE TREE Large tree 100-150 ft in height with clear bole to
60 ft, diameter to 25-30 in. occasionally to 40 in.
and more.

THE TIMBER

Properties Color: Heartwood light to dark reddish-brown when
exposed, sapwood usually narrow whitish or
pale brown not sharply demarcated from
heartwood.

Grain: Usually straight but sometimes coarsely
interlocked, texture fine, luster low.

Weight: Basic specific gravity 0.85
(66 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	17,310	2,700	8,690
12 percent	27,280	3,450	11,640

Processing Drying: Difficult to season, prone to severe checking,
but other reports show that even after rapid
drying, warp is slight and checking negligible.
Shrinkage: Green to oven-dry:

Radial 6.6 percent
Tangential 10.1 percent
Volumetric 16.3 percent

Working properties:

Moderately difficult to machine because of
high density, gives good to excellent
results in almost all cutting operations.

Durability and
preservation

The wood is very durable but only moderately resistant
to drywood termites, very difficult to treat.

Uses Bent work, textile items, railway crossties, heavy
construction, industrial flooring, furniture.

References 2, 5, 6, 7, 8.

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Afzelia africana
Afzelia, apa

Other names: Doussié...Cameroon; mkora...Tanzania;
chanfuta...Mozambique.

Range: Extends across Africa from Senegal to
Sudan and southward to the Congo,
Tanganyika, and Mozambique.

THE TREE Medium-sized tree to 100 ft in height, bole fairly
straight, unbuttressed, diameter to 24 in.

THE TIMBER

Properties Color: Sapwood pale straw, 2 in. wide, heartwood
distinct yellow-brown darkening on
exposure to red-brown.

Grain: Interlocked, texture coarse.

Weight: Average basic specific gravity 0.63
(51 lb/ft³ air-dry).

Strength: (2-cm standard, 12 pct moisture content.)

Bending strength	18,100 lb/in. ²
Modulus of elasticity	1,900,000 lb/in. ²
Maximum crushing strength	11,490 lb/in. ²

Processing Drying: Seasons well with only moderate degrade.
Shrinkage: Green to air-dry:
Radial about 1.0 percent
Tangential about 1.5 percent

Working properties:
Moderately hard to work with machine or hand
tools, tends to blunt cutting edges, preboring
necessary to nail, wood dust irritating.

Durability and preservation Heartwood very durable, moderately resistant to
termite attack, extremely resistant to impregnation.

Uses Joinery, heavy construction, flooring, shipbuilding,
furniture, veneer, turnery, acid-resistant vats and
tanks.

References 1, 2, 3.

Antiaris africana
Antiaris, oro

Other names: Chenchen...Ghana; kirundu...Uganda.

Range: Senegal to Sudan and southward to Uganda.

THE TREE A large tree to 150 ft in height, clear, straight cylindrical bole often to 80 ft, diameter to 72 in., buttresses short or absent.

THE TIMBER

Properties Color: Heartwood white or yellow-brown or gray-yellow not clearly demarcated from sapwood.

Grain: Interlocked, texture medium to coarse.

Weight: Average basic specific gravity 0.35
(27 lb/ft³ air-dry).

Strength: (2-cm standard, 12 pct moisture content.)

Bending strength	8,600 lb/in. ²
Modulus of elasticity.	1,050,000 lb/in. ²
Maximum crushing strength. . . .	5,430 lb/in. ²

Processing Drying: Dries fairly rapidly but with some tendency to warp and end splitting.

Shrinkage: Green to 12 percent moisture content.
Radial 1.5 percent
Tangential 3.0 percent

Working properties:

Works fairly easily with hand and machine tools, slight blunting, some tearing in planing.

Durability and preservation Heartwood perishable and liable to insect attack in both log and converted form; permeable to preservatives.

Uses Utility plywood, decorative veneer, furniture components, boxes, interior trim.

References 1, 2, 3.

Other names: Abel...Cameroon; aiélé...Ivory Coast;
mivafu...Uganda.

Range: Widespread throughout tropical Africa.

THE TREE Up to heights of 120 ft, straight cylindrical bole to
90 ft, diameter sometimes to 48 in., very slight
buttresses.

THE TIMBER

Properties Color: Sapwood up to 4 in. wide and not clearly
differentiated from brownish-yellow to pale
pinkish-brown heartwood.

Grain: Interlocked, texture somewhat coarse,
luster high.

Weight: Average basic specific gravity 0.44
(33 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	^{1,000} lb/in. ²	Lb/in. ²
Green	5,900	900	3,130
12 percent	10,100	1,180	6,160

Processing Drying: Dries rather slowly with little warp, some
tendency to collapse and end-splitting.
Shrinkage: Green to 12 percent moisture
content.
Radial 2.5 percent
Tangential 4.5 percent

Working properties:
Timber works easily with hand and machine
tools but has severe blunting effect due to
silica, machined surfaces tend to be woolly.

Durability and
preservation Heartwood not durable and vulnerable to termite attack,
sapwood liable to powder-post beetle attack; heartwood
extremely resistant to preservative treatment.

Uses Corestock for plywood, decorative veneer, furniture,
interior trim, turnery.

References 1, 2, 3.

Celtis mildbraedii
Celtis, Ohia

Other names: Esa...Ghana.

Range: Ivory Coast to Sudan and southward to
Angola and Tanganyika.

THE TREE

A large tree to height of 150 ft, straight and
cylindrical bole to 90 ft, spreading buttresses up to
10 ft, diameter to 48 in.

THE TIMBER

Properties Color: Sapwood and heartwood not demarcated,
grayish-white on exposure.

Grain: Sometimes straight but frequently irregular,
texture fine to medium.

Weight: Average basic specific gravity 0.63
(49 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	13,100	1,850	6,510
12 percent	20,900	2,310	10,570

Processing Drying: Dries fairly rapidly with little degrade, some
warp and end-splitting, tends to stain; radial
and tangential shrinkage green to oven-dry is
high.

Working properties:

In general the timber is a little hard to
work by hand, but works well with machine
tools, moderately good steam-bending properties.

Durability and
preservation

Heartwood perishable, susceptible to most forms of
insect attack, moderately resistant to preservative
treatment.

Uses Commercial and industrial flooring, heavy construction,
furniture, joinery, plywood.

References 1, 2, 3.

Cordia millenii
Cordia, omo

Other names: Unknown.

Range: Throughout tropical Africa.

THE TREE

Height to 100 ft, bole cylindrical but rarely straight, up to 40 ft, diameter to 36 in.

THE TIMBER

Properties Color: Heartwood varies from pale golden brown to medium brown, occasionally with a pinkish tint, not demarcated from sapwood.

Grain: Somewhat irregular, typically interlocked, texture coarse.

Weight: Average basic specific gravity 0.42 (27 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	7,800	880	3,810
12 percent	9,700	1,000	5,200

Processing Drying: Dries well and rapidly with only a slight tendency to warp, a high temperature kiln schedule is suggested.

Shrinkage: Green to air-dry:

Radial	1.5 percent
Tangential	2.5 percent

Working properties:

Works well with all hand and machine tools, only slight blunting.

Durability and preservation

Heartwood durability variable from moderate to high, resistant to impregnation.

Uses Furniture, joinery, interior trim, light construction.

References 1, 2, 3.

Cylicodiscus gabunensis
Okan

Other names: Denya...Ghana.

Range: Ivory Coast and along Gulf of Guinea to Gabon.

THE TREE

A large tree to height of 200 ft, bole very straight, cylindrical, and clear to 80 ft, very short buttresses, diameters to 120 in.

THE TIMBER

Properties Color: Heartwood yellow to golden brown often with greenish tinge, darkening on exposure to reddish-brown.

Grain: Typically interlocked, texture moderately coarse.

Weight: Average basic specific gravity 0.81 (60 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	14,700	1,850	8,230
12 percent	20,300	2,330	12,380

Processing Drying: Dries slowly with little warp but with a marked tendency to checking and splitting.

Shrinkage: Green to air-dry:

Radial 3.0 percent

Tangential 3.5 percent

Working properties:

Works quite well for its hardness, blunting fairly severe, must prebore to nail.

Durability and preservation

Heartwood very durable and highly resistant to termites, extremely resistant to impregnation.

Uses Piling, dock and wharf construction, industrial flooring.

References 2, 3.

Daniellia ogea
Oziya, daniellia

Other names: Incenso...Portuguese Guinea; fara...
Ivory Coast.

Range: From Senegal southward and eastward to
Gabon.

THE TREE

A large tree to heights of 180 ft, bole straight,
cylindrical, and clear to 100 ft, occasionally with
very short buttresses, diameters to 48 in. and more.

THE TIMBER

Properties Color: Heartwood pale pinkish- to reddish-brown
with occasional darker streaks, gummy,
distinct from 4-7 in. wide straw-colored
sapwood.

Grain: Shallowly interlocked, texture rather
coarse.

Weight: Average basic specific gravity 0.43
(32 lb/ft³ air-dry).

Strength: (2-cm standard, 12 pct moisture content.)

Bending strength	11,800 lb/in. ²
Modulus of elasticity.	1,320,000 lb/in. ²
Maximum crushing strength. . . .	6,030 lb/in. ²

Processing Drying: Dries fairly rapidly with little degrade, some
mild warp and collapse in thick material.

Shrinkage: Green to 12 percent moisture
content:
Radial 1.5 percent
Tangential 4.5 percent

Working properties:

Works easily with hand and machine tools,
quarter cut stock tends to tear in planing and
shaping, blunting is slight.

Durability and
preservation

Heartwood perishable, vulnerable to termite attack,
moderately resistant to preservation treatments.

Uses Veneer, furniture, boxes and crates, interior trim,
joinery.

References 1, 2, 3.

Scottellia coriaceae

Odoko

Other names: Unknown.

Range: Sierra Leone and along Gulf of Guinea to Gabon.

THE TREE Tree reaches a height of 100 ft, bole long and straight but not quite cylindrical with slight fluting, diameter to 24 in.

THE TIMBER

Properties Color: Heartwood pale yellow, not clearly demarcated from sapwood.

Grain: Generally straight but may be slightly interlocked, texture fine.

Weight: Average basic specific gravity 0.50 (39 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	^{1,000} lb/in. ²	Lb/in. ²
Green	12,100	1,640	5,600
12 percent	16,900	1,860	9,200

Processing Drying: Dries fairly rapidly with little warp but has a pronounced tendency to check and split.

Shrinkage: Green to oven-dry:

Radial 2.5 percent

Tangential 5.0 percent

Working properties:

Moderately easy to work with only moderate blunting, rays tend to flake slightly on quartersawn faces.

Durability and preservation

Heartwood not durable, nonresistant to termite attack; permeable.

Uses Furniture, joinery, flooring, plywood, interior trim, turnery.

References 1, 2, 3.

Terminalia superba
Afara

Other names: Ofraam...Ghana; akom...Cameroon;
limba...Congo.

Range: Extending from Guinea eastward and south
to the Congo.

THE TREE Reaches a height of 150 ft, clear bole to 90 ft,
buttresses up to 8 ft, diameter to 60 in.

THE TIMBER

Properties Color: Heartwood usually pale straw to yellow-
brown sometimes with grayish-brown to
nearly black markings, not always clearly
distinct from the sapwood.

Grain: Varies from straight to slightly
interlocked, texture moderately coarse.

Weight: Average basic specific gravity 0.46
(34 lb/ft³ air-dry).

Strength: (2-cm standard, 12 pct moisture content.)

Bending strength	12,100 lb/in. ²
Modulus of elasticity	1,530,000 lb/in. ²
Maximum crushing strength	5,490 lb/in. ²

Processing Drying: Dries rapidly with little or no checking or
warp.

Shrinkage: Green to 12 percent moisture
content:
Radial about 3.0 percent
Tangential about 5.5 percent

Working properties:

Saws easily, slight blunting, works satis-
factorily, some difficulty in planing when
interlocked grain is present.

Durability and preservation Heartwood not durable, vulnerable to insect attack,
resistant to preservation treatment.

Uses Veneer, plywood, furniture, joinery, flooring, light
construction.

References 1, 2, 3.

Other names: Baku...Ghana.

Range: Mostly in West Africa from Sierra Leone to Ivory Coast, Ghana, and Nigeria.

THE TREE A large tree sometimes to 200 ft with clear, straight, cylindrical bole to 100 ft, free from buttresses, diameters generally to 48 in. but may be up to 120 in.

THE TIMBER

Properties Color: Heartwood pinkish- or purplish-brown to dark red, distinct from 2-3 in. wide, pale pink sapwood.

Grain: Generally straight but when interlocked has an attractive mottle figure, texture fine, luster high.

Weight: Average basic specific gravity 0.51 (39 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	10,900	1,190	5,300
12 percent	14,700	1,470	7,730

Processing Drying: Dries at a moderate rate with little degrade, twisting is slight.

Shrinkage: Green to 12 percent moisture content:
Radial 3.0 percent
Tangential 4.5 percent

Working properties:
Works fairly well with hand and machine tools, blunting of tools may be severe due to silica.

Durability and preservation Heartwood is very durable and is highly resistant to termite attack, extremely resistant to impregnation.

Uses Furniture, decorative veneer, light construction, shipbuilding, flooring, millwork, plywood.

References 1, 2, 3.

GABON

References

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Afzelia pachyloba
Doussié

Other names: Apa...Nigeria.

Range: Nigeria south and eastward to the Congo.

THE TREE

Tree to a height of 140 ft, bole fairly cylindrical, rather narrow blunt buttresses, diameters 36-48 in.

THE TIMBER

Properties Color: Heartwood red-brown or orange-brown darkening on exposure, distinct from narrow yellowish-white sapwood.

Grain: Varies from straight to moderately interlocked, mottled figure, texture rather coarse.

Weight: Average basic specific gravity 0.64
(51 lb/ft³ air-dry).

Strength: (2-cm standard, 12 pct moisture content.)

Bending strength	18,100 lb/in. ²
Modulus of elasticity.	1,900,000 lb/in. ²
Maximum crushing strength. . . .	11,490 lb/in. ²

Processing Drying: Timber seasons well but slowly, degrade not likely to be severe.

Shrinkage: To 12 percent moisture content:
Radial 1.0 percent
Tangential 1.5 percent

Working properties:

Works fairly well with hand tools, preboring necessary for nailing, moderate blunting of cutting tools.

Durability and preservation

Heartwood very durable, moderately resistant to termite attack, extremely resistant to impregnation.

Uses Heavy construction, joinery, millwork, flooring, boatbuilding, furniture, railway crossties.

References 1, 2, 3.

Range: Sierra Leone to Gabon.

THE TREE Tree height of 120 ft with clear, straight bole free
of buttresses, diameter to 36 in.

Properties	Color:	Heartwood pink-buff color, not sharply demarcated from the sapwood.
	Grain:	Usually interlocked, texture medium to fine, gum ducts and silica.
	Weight:	Average basic specific gravity 0.52 (40 lb/ft ³ air-dry).
	Strength:	(2-cm standard, 12 pct moisture content.)
	Bending strength	18,670 lb/in. ²
	Modulus of elasticity	1,500,000 lb/in. ²
	Maximum crushing strength	7,980 lb/in. ²

Processing	Drying:	Must be seasoned with care.	
	Shrinkage:	Green to oven-dry:	
		Radial	5.3 percent
		Tangential	8.6 percent
		Volumetric	14.7 percent

Working properties:
Works fairly well with hand and machine tools but with marked dulling effect due to silica content.

Durability and preservation	Heartwood only moderately durable and liable to termite attack, rather resistant to impregnation.
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Uses General construction, flooring, furniture, veneer, joinery, turnery.

References 1, 4.

Tiama

Other names: Gedu nohor...Nigeria; edinam...Ghana;
kalungi...Congo.

Range: Throughout tropical Africa from Guinea
south and eastward to Uganda and Angola.

THE TREE Reaches a height of 160 ft, long straight bole to
80 ft, broad buttresses, diameter to 60 in. and more.

THE TIMBER

Properties Color: Heartwood varies from pale pink to pink-
brown or dull reddish-brown distinct from
4 in. wide, lighter sapwood.

Grain: Grain interlocked but producing rather wide
irregular stripe when quartered, texture
moderately coarse.

Weight: Average basic specific gravity 0.44
(34 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	^{1,000} lb/in. ²	Lb/in. ²
Green	7,500	1,000	3,680
12 percent	11,200	1,250	6,550

Processing Drying: Dries fairly rapidly with a marked tendency
to warp.

Shrinkage: Green to 12 percent moisture
content:
Radial 2.5 percent
Tangential 5.0 percent

Working properties:
Timber saws easily and works well with other
machine and hand tools, interlocked grain
picks up in planing.

Durability and
preservation Heartwood moderately durable but nonresistant to
termite attack, extremely resistant to preservation
treatment.

Uses Furniture, veneer, exterior and interior joinery,
boatbuilding, flooring, turnery.

References 1, 2, 3.

Entandrophragma candollei
Kosipo

Other names: Atom-assié...Cameroons; lifaki...Congo.

Range: From Guinea south and eastward to the Congo.

THE TREE

A large tree to 160 ft height and more, bole straight and cylindrical to 90 ft, buttresses blunt and often indistinct, diameter to 120 in.

THE TIMBER

Properties Color: Heartwood dull brown often with a purplish tinge, darkening on exposure, sharply demarcated from pale brown sapwood.

Grain: Grain usually straight but interlocking may occur, texture coarse.

Weight: Average basic specific gravity 0.53
(40 lb/ft³ air-dry).

Strength: (2-cm standard, 12 pct moisture content.)

Bending strength	16,240 lb/in. ²
Modulus of elasticity.	1,150,000 lb/in. ²
Maximum crushing strength. . . .	6,830 lb/in. ²

Processing Drying: Dries rather slowly with a marked tendency to warp.

Shrinkage: Green to 12 percent moisture content:
Radial 4.0 percent
Tangential 6.0 percent

Working properties:

Satisfactory in sawing, tends to tear in planing and burn in boring, moderate blunting effect.

Durability and preservation

Heartwood moderately durable, resistant to preservation treatment.

Uses Veneer, cabinetwork, furniture, boatbuilding, flooring, interior trim, turnery.

References 1, 2, 3, 4.

Fagara macrophylla
Olon

Other names: Bongo...Cameroons; mungutsende...Congo.

Range: From Sierra Leone south and eastward to Angola and Uganda.

THE TREE A small tree to heights of 40 ft but may reach 100 ft, diameter to 24 in.

THE TIMBER

Properties Color: Heartwood bright yellow or pale yellow, not distinct from sapwood.

Grain: Interlocked giving a stripe and sometimes fiddleback figure, texture varies from fine to coarse.

Weight: Average basic specific gravity 0.58
(45 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	9,000	1,500	4,500
12 percent	13,500	1,800	7,700

Processing Drying: Air seasons rapidly with little degrade but some tendency to warp.

Shrinkage: To 12 percent moisture content:
Radial about 3.0 percent
Tangential about 5.0 percent

Working properties:
Generally moderately difficult to work but takes a fine smooth finish, good steam-bending properties.

Durability and preservation Heartwood durable but not resistant to termite attack, heartwood moderately resistant to pressure impregnation.

Uses Furniture, joinery, flooring, boatbuilding, veneer, turnery.

Reference 1.

Guibourtia arnoldiana
Mutenye

Other names: Unknown.

Range: West Central Africa.

THE TREE Height to 90 ft, bole irregular to 60 ft, diameter to 30 in.

THE TIMBER

Properties Color: Heartwood pale yellowish-brown to medium brown with gray to black veining.

Grain: Interlocked and sometimes wavy, decorative figure, fine texture.

Weight: Average basic specific gravity 0.71
(55 lb/ft³ air-dry).

Strength: (2-cm standard, 12 pct moisture content.)

Bending strength	26,840 lb/in. ²
Modulus of elasticity.	2,030,000 lb/in. ²
Maximum crushing strength. . . .	11,390 lb/in. ²

Processing Drying: Must be seasoned with care.

Shrinkage: Green to ovendry:

Radial 4.8 percent

Tangential 8.7 percent

Volumetric 11.7 percent

Working properties:

Satisfactory in sawing but planing of quartersawn stock is difficult.

Durability and preservation

Heartwood moderately durable and somewhat resistant to termites.

Uses Turnery, flooring, furniture, decorative veneer.

References 2, 4.

Lophira alata
Azobé

Other names: Bongossi...Cameroon; kaku...Ghana;
eba...Nigeria.

Range: Extending from Sierra Leone to the Congo.

THE TREE

Reaches a height of 180 ft, clear boles to 100 ft,
usually without buttresses, diameters to 60 in. and
more.

THE TIMBER

Properties Color: Heartwood red or deep chocolate brown with
conspicuous white deposits in the pores;
sapwood pale pink, up to 2 in. wide.

Grain: Usually interlocked, occasional figure;
texture coarse and uneven.

Weight: Average basic specific gravity 0.89
(67 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	^{1,000} lb/in. ²	Lb/in. ²
Green	17,800	2,010	9,920
12 percent	25,800	2,450	13,120

Processing Drying: Very difficult to season without excessive
degrade, particularly surface checking and
end splitting, dries very slowly.

Shrinkage: Green to 12 percent moisture
content:
Radial 4.5 percent
Tangential 5.5 percent

Working properties:
Difficult to work with hand and machine tools,
severe blunting of cutters.

Durability and
preservation

Very durable but moderately resistant to termite
attack, resistant to teredo; heartwood impermeable.

Uses Railway crossties, dock and wharf construction, heavy
duty flooring, mine timbers, turnery.

References 1, 2, 3.

Lovoa trichilioides
Dibetou

Other names: Apopo...Nigeria; bibolo...Cameroons;
bombolu...Congo.

Range: From Sierra Leone south and eastward to
the Congo and Angola.

THE TREE Reaches a height of 150 ft, bole cylindrical and clear
to 90 ft, short buttresses, diameters to 48 in.

THE TIMBER

Properties Color: Heartwood yellow-brown with dark markings,
distinct from the narrow buff colored
sapwood.

Grain: Usually interlocked with well-marked
ribbon grain when quartersawn, texture
moderately fine to medium.

Weight: Average basic specific gravity 0.44
(34 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	8,200	1,060	4,320
12 percent	11,900	1,340	6,990

Processing Drying: Dries fairly rapidly with little degrade.
Shrinkage: Green to 12 percent moisture
content:
Radial 2.0 percent
Tangential 5.0 percent

Working properties:
Works fairly easily with most tools, tends to
pickup on quartersawn stock.

Durability and
preservation Heartwood moderately durable, vulnerable to termite
attack, extremely resistant to preservative treatment.

Uses Furniture, veneer, millwork, cabinetwork, joinery,
flooring.

References 1, 2, 3.

Sterculia oblonga
Eyong

Other names: Okoko...Nigeria; bongele...Cameroon.

Range: From Ivory Coast east and southward to
Ghana, Cameroons, and Gabon.

THE TREE

Reaches a height of 120 ft, bole straight, cylindrical,
and clear to 70 ft, sharp buttresses to 10 ft,
diameters to 36 in.

THE TIMBER

Properties Color: Heartwood creamy-white to light yellowish-
brown, sapwood not clearly distinct.

Grain: Shallowly interlocked, high rays give a
fleck figure when quartersawn, texture
rather coarse.

Weight: Average basic specific gravity 0.63
(49 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	11,700	1,500	5,610
12 percent	17,900	1,980	9,750

Processing Drying: Dries slowly with marked tendency to surface
checking and end splitting, cup and collapse
develops.

Shrinkage: Green to 12 percent moisture
content:
Radial 3.5 percent
Tangential 6.5 percent

Working properties:

Works well with hand and machine tools,
dressed surfaces are fibrous.

Durability and
preservation

Heartwood is perishable and nonresistant to termite
attack, extremely resistant to preservation treatment.

Uses General light construction work where durability is
not important.

Reference 2.

Tarrietia utilis
Niangon

55

Other names: Nyankom...Ghana.

Range: From Sierra Leone south and eastward to Gabon.

THE TREE

Reaches a height of 100 ft, but occasionally to 130 ft, bole usually straight and cylindrical to 65 ft and more, buttressed, diameters to 36 in.

THE TIMBER

Properties Color: Varies from pale pink to reddish-brown, darkening on exposure, not clearly demarcated from sapwood.

Grain: Generally interlocked, sometimes wavy, conspicuous ray figure, texture rather coarse.

Weight: Average basic specific gravity 0.51 (39 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	10,200	1,220	5,300
12 percent	13,000	1,380	7,500

Processing Drying: Dries fairly rapidly with very little warp or checking, tendency to twist.

Shrinkage: Green to 12 percent moisture content:

Radial 2.5 percent

Tangential 4.5 percent

Working properties:

Fairly easy to work, blunting is moderate, not easy to finish or glue because of resins.

Durability and preservation

Heartwood is durable and resistant to insect attack, extremely resistant to impregnation.

Uses Furniture, carpentry, joinery, boatbuilding, general construction.

Reference 2.

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Manila.

Alphonsea arborea
Bolon

Other names: Lanutan...Tayabas; taputosa...Davao;
lalapid...Zamboanga.

Range (in the Philippines):
Luzon, Mindora, Masbate, Ticao, Leyte,
Cebu, and Mindanao.

THE TREE Medium-sized to 120 ft in height, bole straight,
cylindrical, without buttresses, diameter 25-30 in.

THE TIMBER

Properties Color: Heartwood buff-colored not sharply
demarcated from sapwood.

Grain: Grain straight, texture moderately fine,
low luster.

Weight: Average basic specific gravity 0.71
(54 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	12,510	1,850	5,300
12 percent	20,000	2,370	8,900

Processing Drying: Seasons well.
Shrinkage: Green to oven-dry:
Radial 5.2 percent
Tangential 9.0 percent

Working properties:
Easy to work.

Durability and preservation Not resistant to decay fungi, vulnerable to termite
attack.

Uses Tool handles, furniture, flooring, turnery.

References 2, 3.

Alstonia scholaris
Dita

Other names: Andaragan...Cagayan; lonog...Cebu;
dirita...Bataan.

Range (in the Philippines):
From northern Luzon to Mindanao and
Palawan.

THE TREE A large tree with clear straight bole to 50 ft,
generally fluted, diameter to 35 in.

THE TIMBER

Properties Color: Heartwood light yellowish-brown not
distinct from the sapwood.

Grain: Usually straight but sometimes twisted or
curly, texture moderately coarse, luster
high.

Weight: Average basic specific gravity 0.38
(30 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	5,780	957	3,100

Processing Drying: Seasons well, requires rapid drying to avoid
blue stain.

Shrinkage: Green to oven-dry:
Radial 4.0 percent
Tangential 6.0 percent

Working properties:
Very easy to work with hand and machine tools.

Durability and
preservation Vulnerable to decay and insect attack, easy to treat.

Uses Blockboard, pulp and paper, floats, veneer corestock,
turnery (bowls).

References 2, 3.

Anthocephalus chinensis
Kaatoan bangkal

Other names: Magalablab, sapawan...Philippines;
kadam...Central America.

Range: Philippines, Malaysia, Sumatra, Borneo.

THE TREE

Reaches a height of 100 ft, bole is straight, more or less cylindrical and unbuttressed, diameter to 25 in.

THE TIMBER

Properties Color: Heartwood pale straw not distinct from the sapwood.

Grain: Straight, texture fine.

Weight: Average basic specific gravity 0.31
(23 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	5,000	740	2,340

Processing Drying: Dries very rapidly with very little or no degrade.

Shrinkage: Green to oven-dry:
Radial 2.8 percent
Tangential 6.9 percent

Working properties:
Very easy to work with hand and machine tools, dresses to very smooth surfaces.

Durability and preservation Heartwood nondurable and vulnerable to termite attack, very permeable and easy to impregnate.

Uses Pulp and paper, veneer, carving, match sticks, pencil slats, furniture components, millwork.

References 1, 3.

Artocarpus spp.
Antipolo

Other names: Kamansé...Bataan; togog...Leyte;
razara...Palawan.

Range (in the Philippines):
Very widely distributed throughout the
Archipelago.

THE TREE A medium-sized to large tree to height of 100 ft,
cylindrical bole but with prominent buttresses,
diameter to 35 in.

THE TIMBER

Properties Color: Heartwood bright yellow when fresh turning
russet upon exposure, distinct from light
buff sapwood.

Grain: Grain interlocked, texture moderately
coarse, luster high.

Weight: Average basic specific gravity 0.53
(40 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	10,200	1,630	5,030

Processing Drying: Seasons well with little degrade.
Shrinkage: Green to oven-dry:
Radial 2.9 percent
Tangential 5.5 percent

Working properties:
Difficult to work due to dulling effect of
cell deposits.

Durability and
preservation Heartwood durable and resistant to termite attack.

Uses Furniture, paneling, cabinetwork, musical instruments,
house posts.

References 2, 3.

Bischofia javanica
Tuai

Other names: Tua...Laguna; akayan...Cebu; mandos...
Mindanao; ayuni...Bataan.

Range (in the Philippines):
From northern Luzon to Palawan and
Mindanao.

THE TREE A large tree but with a very short bole seldom to
30 ft, free of buttresses, diameter to 60 in.

THE TIMBER

Properties Color: Heartwood brownish-red to deep brick red,
 distinct from narrow light red sapwood.

 Grain: Mostly interlocked, texture moderately fine,
 low luster.

 Weight: Average basic specific gravity 0.56
 (45 lb/ft³ air-dry).

 Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	6,900	852	3,600
12 percent	16,000	1,600	7,100

Processing Drying: Needs to be dried carefully, warp and checking
are usually severe.

 Shrinkage: Green to ovendry:
 Radial 4.4 percent
 Tangential 9.8 percent

Working properties:
Easy to work with hand and machine tools.

Durability and Heartwood is not durable but is moderately resistant
preservation to attack by powder-post beetles and drywood termites.

Uses Light construction, pulp and paper.

References 2, 3.

Celtis luzonica
Magabuyo

Other names: Unknown.

Range (in the Philippines):
From northern Luzon to Mindanao.

THE TREE A medium-sized tree with cylindrical trunk to 40 ft
and more, diameter to 30 in.

THE TIMBER

Properties Color: Heartwood coffee-colored when dry, not
 distinct from straw-colored sapwood.

 Grain: Usually interlocked and wavy, texture
 moderately coarse, low luster.

 Weight: Average basic specific gravity 0.56
 (45 lb/ft³ air-dry).

 Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	7,850	1,210	4,000
12 percent	12,370	1,550	6,700

Processing Drying: No data.

 Shrinkage: Green to ovendry:
 Radial 3.2 percent
 Tangential 5.4 percent

Working properties:
Difficult to work due to crystalline (silica)
deposits which dull the tools.

Durability and
preservation Heartwood is perishable and vulnerable to termite
attack.

Uses General construction.

References 2, 3.

Lagerstroemia speciosa
Banabā

Other names: Nabulong...Cagayan; mitla...Tarlac;
pamalasagon...Leyte; abak...Zamboanga.

Range (in the Philippines):

Reported from almost all provinces from
northern Luzon to Sulu Archipelago and
Mindanao.

THE TREE

Medium-sized to a height of 80 ft, bole usually short,
irregular, not strongly buttressed, diameter to 45 in.

THE TIMBER

Properties Color: Heartwood reddish-brown not well demarcated
from the sapwood.

Grain: Grain usually straight, sometimes wavy,
texture varies from somewhat fine to
moderately coarse.

Weight: Average basic specific gravity 0.53
(40 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	9,200	1,290	4,400
12 percent	14,000	1,530	7,240

Processing Drying: Fairly easy to dry with little or no degrade
due to warp or checking.

Shrinkage: Green to oven-dry:
Radial no data
Tangential no data

Working properties:
Fairly easy to work and takes a high finish.

Durability and
preservation Moderately durable in ground contact and highly
resistant to termite attack, very difficult to treat.

Uses Furniture, interior finish, flooring, cabinetwork.

References 2, 3.

Polyscias nodosa
Malapapaya

Other names: Pakal-pakal...Samar; karakaya...Leyte;
hagdan-anak...Cebu.

Range (in the Philippines):
Luzon, Palawan, Leyte, Mindanao, and
Basilan.

THE TREE A tall slender tree, bole regular to 40 ft, without
buttresses, diameter to 25 in.

THE TIMBER

Properties Color: Heartwood light buff to pinkish-buff, not
distinct from sapwood.

Grain: Straight-grained, texture fine, luster
medium.

Weight: Average basic specific gravity 0.37
(28 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	6,450	1,200	2,900
12 percent	9,030	1,270	4,300

Processing Drying: Seasons well with little or no warp and
checking but prone to blue stain.
Shrinkage: Green to oven-dry:
Radial 4.0 percent
Tangential 6.7 percent

Working properties:
Easy to work with hand and machine tools.

Durability and
preservation Not resistant to decay and vulnerable to termite attack.

Uses Matches, match boxes, wooden shoes.

References 2, 3.

Strombosia philippinensis
Tamayuan

Other names: Kamayuan...Bataan; tamanhuyan...Leyte;
tamuyan...Cagayan.

Range (in the Philippines):
Widely distributed from Luzon to
Mindanao.

THE TREE A medium-sized tree to height of 100 ft, bole
cylindrical, without buttresses, diameter to 25-30 in.

THE TIMBER

Properties Color: Heartwood chocolate-brown, distinct from
the rather thick buff-colored sapwood.

Grain: Grain straight, texture fine, high luster.

Weight: Average basic specific gravity 0.74
(56 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	14,000	1,800	7,100
12 percent	17,500	1,970	9,530

Processing Drying: Prone to checking.

Shrinkage: Green to oven-dry:
Radial 5.3 percent
Tangential 9.1 percent

Working properties:
Considering the high density, the wood is
not difficult to work and takes a high polish.

Durability and
preservation Heartwood is moderately durable and highly resistant
to termite attack.

Uses Walking sticks, novelties, shuttles and bobbins,
heavy construction (posts).

References 2, 3.

Trema orientalis
Anabiong

Other names: Anadong...Pangasinan; maladurong...
Pampanga; mandaragon...Davao.

Range (in the Philippines):
Pioneer species common throughout the
Philippines.

THE TREE Small to medium-sized tree, bole straight and
cylindrical but short, diameter up to 20 in.

THE TIMBER

Properties Color: Heartwood buff, not distinct from sapwood.

Grain: Grain is straight, texture moderately
coarse.

Weight: Average basic specific gravity 0.36
(28 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	5,200	765	2,000
12 percent	8,750	925	3,900

Processing Drying: No data.
Shrinkage: Green to oven-dry:
Radial 3.5 percent
Tangential 7.7 percent

Working properties:
Easy to work with hand and machine tools.

Durability and
preservation Heartwood very perishable and also readily attacked by
termites.

Uses Floats, shoe parts, pulp and paper, charcoal.

References 2, 3.

MALAYSIA

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Publishing House, Singapore.
3. Lavers, G. M.
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Anisoptera spp.
Mersawa

Other names: Palosapis...Philippines; krabak...
Thailand; phdiek...Cambodia.

Range: From Burma through Malaysia to Thailand.

THE TREE A tall tree to 200 ft with well-formed bole to 80 ft,
pronounced buttress, diameters to 45 in.

THE TIMBER

Properties	Color:	Heartwood light to dark yellow, sapwood lighter but not sharply defined.
	Grain:	Interlocked but usually not very deeply so, texture moderately coarse.
	Weight:	Average basic specific gravity 0.51 (40 lb/ft ³ air-dry).
	Strength:	(2-in. standard, green.)
	Bending strength	8,980 lb/in. ²
	Modulus of elasticity.	1,650,000 lb/in. ²
	Maximum crushing strength. . . .	4,770 lb/in. ²

Processing	Drying:	Dries slowly and without severe degrade, slight checking and warp may occur.
	Shrinkage:	Green to 12 percent moisture content:
		Radial 3.0 percent
		Tangential 6.5 percent

Working properties:

Timber is fairly hard to saw and work,
irregular grained material tends to pick
up in planing, appreciable blunting due to
silica.

Durability and preservation	Heartwood not durable, vulnerable to termite attack; moderately resistant to impregnation.
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Uses	Veneer, furniture, joinery, flooring, panelling.
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References	1, 2.
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Canarium euphyllum
Kedondong

Other names: White dhup...India; and Andaman Islands.

Range: Burma, Andaman Islands, Malaysia.

THE TREE

Reaches a height of 100 ft with a clear bole of 40 ft above a small buttressed base, diameter commonly to 24 in.

THE TIMBER

Properties Color: Heartwood usually pink or light brown, sometimes with yellow streaks, not sharply demarcated from sapwood.

Grain: Shallowly interlocked, texture moderately coarse.

Weight: Average basic specific gravity 0.35
(26 lb/ft³ air-dry).

Strength: (2-in. standard, air-dry.)

Bending strength about 8,000 lb/in.²
Maximum crushing strength. . . . about 4,000 lb/in.²

Processing Drying: Timber easy to season with little degrade, prone to blue staining.
Shrinkage data not available but is reported to be low.

Working properties:

Easy to saw and work and takes a smooth, clear finish, there is grain pickup when planing radial faces.

Durability and
preservation

Heartwood perishable and vulnerable to insect attack, extremely resistant to preservation treatment.

Uses Packing cases, floats, millwork, joinery, utility veneer.

References 1, 2.

Cratoxylon arborescens
Serungan

Other names: Geronggang...West Malaysia and Sarawak.

Range: Throughout Malaysia and Indonesia.

THE TREE A large tree of good form but rather short bole, usually reaches a diameter of 25 in. but may get to 45 in.

THE TIMBER

Properties Color: Heartwood dark pink or light brick red but darkening on exposure; sapwood yellow with pink or orange tinge, somewhat differentiated from heartwood.

Grain: Usually straight but sometimes shallowly interlocked, texture rather coarse.

Weight: Average basic specific gravity 0.38
(28 lb/ft³ air-dry).

Strength: (2-in. standard, green.)

Bending strength	5,750 lb/in. ²
Modulus of elasticity.	1,160,000 lb/in. ²
Maximum crushing strength. . . .	2,660 lb/in. ²

Processing Drying: The timber seasons rapidly without serious degrade.

Shrinkage: Green to oven-dry:
Radial 2.6 percent
Tangential 4.7 percent

Working properties:

Timber saws without difficulty and planes to a smooth surface with some torn grain on radial faces; fairly rapid dulling due to silica.

Durability and preservation Heartwood not durable and prone to termite attack; easy to impregnate.

Uses General utility wood, furniture, joinery, plywood, light packing cases.

References 1, 2.

Eusideroxylon zwageri
Belian

Other names: Tambulian...Philippines; boelian...
Indonesia; ku'an tin...Hong Kong.

Range: Sabah and throughout Borneo, Sumatra and
Philippines,

THE TREE Stems are short though of fairly good form, unbuttressed,
diameters to 45 in.

THE TIMBER

Properties Color: Heartwood bright yellow to light brown when
fresh, darkens to deep reddish-brown;
sharply demarcated from lighter yellow
sapwood..

Grain: Straight or shallowly interlocked, texture
moderately fine, somewhat lustrous.

Weight: Average basic specific gravity 0.85
(64 lb/ft³ air-dry).

Strength: (2-cm standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	20,740	2,570	11,580
12 percent	25,800	2,650	13,620

Processing Drying: Timber dries rather slowly and is liable to
surface checking.

Shrinkage: Green to ovendry:
Radial 4.3 percent
Tangential 7.5 percent

Working properties:
Easy to saw and machine though of high
density, dulling of cutters due to hardness,
needs to be prebored for nailing and
screwing.

Durability and
preservation Heartwood is very durable and immune to termite attack;
highly resistant to marine borers, wood is impermeable.

Uses Heavy construction timber, marine piling, industrial
floors, boatbuilding.

References 1, 3.

Intsia spp.
Merbau

Other names: Ipil...Philippines; lum-pho...Thailand;
go-nuoc...Vietnam.

Range: Common throughout southeast Asia and
southwest Pacific.

THE TREE A large tree with rather short bole and large spreading
buttresses, diameters to 60 in.

THE TIMBER

Properties Color: Heartwood yellowish to orange-brown
 turning brown or dark red-brown, sharply
 demarcated from pale yellow to light buff
 sapwood.

Grain: Interlocked but sometimes slightly so,
 texture rather coarse, sometimes lustrous.

Weight: Average basic specific gravity 0.65
 (52 lb/ft³ air-dry).

Strength: (2-in. standard, green.)

Bending strength	14,900 lb/in. ²
Modulus of elasticity	2,000,000 lb/in. ²
Maximum crushing strength	8,000 lb/in. ²

Processing Drying: Seasons well with little degrade.
 Shrinkage: Green to 12 percent moisture
 content:
 Radial 1.2 percent
 Tangential 2.6 percent

Working properties:
Planes to a smooth surface, some gumming in
sawing, turns well, moderate blunting effect.

Durability and
preservation Heartwood durable and highly resistant to termite
attack; resistant to impregnation.

Uses Flooring, furniture, turnery, joinery.

References 1, 2.

Koompassia excelsa
Mengaris

Other names: Tualang...West Malaysia; tapang...
Sarawak; manggis...Philippines.

Range: Malay Peninsula, Sumatra, Borneo, and
Philippines.

THE TREE A large tree to heights of 200 ft, wide spreading
buttress, excellent form with clear boles to 80 ft,
diameters to 55-60 in.

THE TIMBER

Properties Color: Heartwood reddish-brown to deep brick red
when freshly cut, darkening to chocolate
brown; sapwood yellow-brown and distinct
from heartwood.

Grain: Deeply interlocked, texture rather coarse,
prominent ribbon figure.

Weight: Average basic specific gravity 0.73
(54 lb/ft³ air-dry).

Strength: (2-in. standard, green.)

Bending strength	14,800 lb/in. ²
Modulus of elasticity.	2,380,000 lb/in. ²
Maximum crushing strength. . . .	7,760 lb/in. ²

Processing Drying: Timber dries rather slowly, slight end
checking develops.

Shrinkage: Green to air-dry:

Radial 1.5 percent

Tangential 1.9 percent

Working properties:

Sawing is easy, and otherwise works well with
machine tools, picks up in planing, hard to
work with hand tools.

Durability and
preservation

Heartwood moderately durable in ground contact, not
resistant to termite attack; heartwood difficult to
impregnate.

Uses Furniture, general construction, turnery, charcoal.

References 1, 2.

Nauclea spp.
Neonauclea spp.
 Bangkal

Other names: Ludek...Philippines; tjantaratan...
 Indonesia; mengkal...West Malaysia;
 lenggaung...Sarawak.

Range: Common over large areas in southeast
 Asia.

THE TREE Small to medium-sized trees with diameters to 20-25 in.

THE TIMBER

Properties Color: Heartwood bright yellow, pale pink, to deep
 orange and orange-red; sapwood lighter
 colored but merging gradually into heartwood.

Grain: Grain interlocked, texture moderately fine
 to slightly coarse, stripe figure on radial
 face.

Weight: Average basic specific gravity 0.55
 (43 lb/ft³ air-dry).

Strength: (2-in. standard, green.)

Bending strength 13,800 lb/in.²
 Modulus of elasticity. 1,834,000 lb/in.²
 Maximum crushing strength. --

Processing Drying: Generally seasons well though with some
 checking and a tendency to warp.

Shrinkage: Green to oven-dry:
 Radial 4.4 percent
 Tangential 8.6 percent

Working properties:
 The timber is easy to work and finishes well.

Durability and
 preservation Heartwood durable but vulnerable to termite attack.

Uses Flooring, furniture, core and back veneers in plywood.

References 1, 2.

Pterocarpus indicus
Sena

Other names: Angsana...Sabah; narra...Philippines.

Range: Common coastal tree Philippines, Malaysia.

THE TREE

May reach a height of 100 ft, form not good because of low branches and high buttresses, diameter to 30 in.

THE TIMBER

Properties Color: Heartwood golden-brown, distinct from pale-straw-colored sapwood.

Grain: Interlocked and sometimes wavy, texture moderately coarse, has an attractive figure.

Weight: Average basic specific gravity 0.52
(37 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	11,034	1,440	5,570
12 percent	--	1,610	8,450

Processing Drying: Seasons well with very little degrade and is very stable in use.

Shrinkage: Green to 12 percent moisture content:
Radial 1.1 percent
Tangential 2.0 percent

Working properties:

Wood is easy to work with both hand and machine tools, may pick up in planing.

Durability and preservation

Generally performance indicates heartwood is very durable and not readily attacked by termites, believed to be resistant to impregnation.

Uses Furniture, drawing instruments, fine cabinetwork.

References 1, 2.

Other names: Tampar hantu...Sarawak; supa...Philippines;
sindur...Indonesia; makata...Thailand.

Range: Malaysia, Brunei, Thailand, Philippines,
Indonesia.

THE TREE

A large tree to a height of 150 ft, boles clear to
45 ft, diameter to 48 in., but mostly to 30 in.

THE TIMBER

Properties Color: Brown with a pink or golden tinge, darkening
on exposure, often with darker streaks;
sapwood up to 12 in. wide, light brown, and
usually clearly defined.

Grain: Grain straight or shallowly interlocked,
texture moderately fine, luster low.

Weight: Average basic specific gravity 0.54
(41 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	$\frac{1,000}{\text{lb/in.}^2}$	Lb/in. ²
Green	11,700	1,470	5,690
12 percent	18,100	1,840	9,250

Processing Drying: Dries slowly but without difficulty, small
movement.
Shrinkage: Green to 12 percent moisture
content:
Radial 2.0 percent
Tangential 3.0 percent

Working properties:

Tends to build up gum on saws, planes well to
a smooth surface, difficult to work with hand
tools, rapid blunting of cutters though
non-siliceous.

Durability and
preservation

Heartwood rated durable to moderately durable, not
resistant to termites; heartwood extremely resistant
to impregnation.

Uses Millwork, joinery, furniture, flooring, cabinetwork.

References 1, 2.

Tarrietia spp.
Mengkulang

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Other names: Kembang...Sabah; kanze...Burma;
lumbayau...Philippines.

Range: Philippines, Malaysia, Indonesia, Burma.

THE TREE

Medium-sized to large tree to heights of 140 ft,
buttressed but with clear bole to 60 ft and more,
diameters to 46 in.

THE TIMBER

Properties Color: Heartwood of various shades of brown to red-
brown, sometimes with dark almost black
streaks; sapwood lighter but not always
distinct.

Grain: Straight to shallowly interlocked, texture
slightly to moderately coarse, conspicuous
ray figure.

Weight: Average basic specific gravity 0.61
(47 lb/ft³ air-dry).

Strength: (2-in. standard.)

Moisture content	Bending strength	Modulus of elasticity	Maximum crushing strength
	Lb/in. ²	1,000 lb/in. ²	Lb/in. ²
Green	8,650	1,400	6,000

Processing Drying: Wood seasons rapidly, requires care to
minimize warping and checking.
Shrinkage: Green to 12 percent moisture
content:
Radial 1.5 percent
Tangential 3.7 percent

Working properties:
Somewhat difficult to saw due to silica,
quartersawn material picks up in planing,
generally finishes well.

Durability and
preservation

Heartwood is not durable in ground contact but
resistant to insect attack, somewhat treatable by
open tank methods.

Uses General utility timber, plywood, flooring, furniture,
decorative veneers, millwork.

References 1, 2.